January 11, 2012

Mr. Patrick L. Paquin
General Manager – Engineering
and Licensing
Energy*Solutions*
Suite 100, Center Point II
100 Center Point Circle
Columbia, SC 29210

SUBJECT: CERTIFICATE OF COMPLIANCE NO. 9204 FOR THE MODEL NO. 10-160B

Dear Mr. Paquin:

As requested by your letter dated September 9, 2011, enclosed is Certificate of Compliance No. 9204, Revision No. 18, for the Model No. 10-160B package. Changes made to the enclosed certificate are indicated by vertical lines in the margin. The staff's Safety Evaluation Report is also enclosed.

The approval constitutes authority to use the package for shipment of radioactive material and for the package to be shipped in accordance with the provisions of 49 CFR 173.471.

If you have any questions regarding this certificate, please contact Pierre Saverot of my staff at (301) 492-3408.

Sincerely,

/RA/

Michael D. Waters, Chief
Licensing Branch
Division of Spent Fuel Storage and Transportation
Office of Nuclear Material Safety
and Safeguards

Docket No. 71-9204
TAC No. L24568

Enclosures:
1. Certificate of Compliance No. 9204, Rev. No. 18
2. Safety Evaluation Report

cc w/encl 1 & 2: R. Boyle, Department of Transportation
J. Shuler, Department of Energy
Registered Users

Mr. Patrick L. Paquin
General Manager – Engineering
and Licensing
Energy*Solutions*
Suite 100, Center Point II
100 Center Point Circle
Columbia, SC 29210

SUBJECT: CERTIFICATE OF COMPLIANCE NO. 9204 FOR THE MODEL NO. 10-160B

Dear Mr. Paquin:

As requested by your letter dated September 9, 2011, enclosed is Certificate of Compliance No. 9204, Revision No. 18, for the Model No. 10-160B package. Changes made to the enclosed certificate are indicated by vertical lines in the margin. The staff's Safety Evaluation Report is also enclosed.

The approval constitutes authority to use the package for shipment of radioactive material and for the package to be shipped in accordance with the provisions of 49 CFR 173.471.

If you have any questions regarding this certificate, please contact Pierre Saverot of my staff at (301) 492-3408.

Sincerely,

/RA/

Michael D. Waters, Chief
Licensing Branch
Division of Spent Fuel Storage and Transportation
Office of Nuclear Material Safety
and Safeguards

Docket No. 71-9204
TAC No. L24568

Enclosures:
1. Certificate of Compliance No. 9204, Rev. No. 18
2. Safety Evaluation Report

cc w/encl 1 & 2: R. Boyle, Department of Transportation
J. Shuler, Department of Energy
Registered Users

(Closes TAC No. L24568)

G:SFST\Part 71 Casework\71-9204.r18.letter&ser.doc and 71-9204.r18.doc
ADAMS Package No.: ML120110332 ADAMS Letter No.: ML120110335

OFC:	SFST E	SFST E	SFST	SFST	SFST	SFST
NAME:	P. Saverot	NDay	CHrabal	LCruz	MRahimi	DPstrak
DATE:	12/15/2011	12/20/2011	12/27/2011	12/19/2011	12/27/2011	12/29/2011
OFC	SFST					
NAME	MSampson	MDeBose	MWaters			
DATE	12/28/2011	01/04/2012	1/11/12			

SAFETY EVALUATION REPORT
Docket No. 71-9204
Model No. 10-160B
Certificate of Compliance No. 9204
Revision No. 18

SUMMARY

By letter dated September 9, 2011, supplemented October 28, 2011, Energy*Solutions* requested the addition of a Source Insert containing up to 10,000 Ci of ^{60}Co as authorized contents in the Model No. 10-160B package.

NRC staff reviewed the applicant's request and the supplement dated October 28, 2011, and found that it did not affect the ability of the package to meet the requirements of 10 CFR Part 71.

1.0 GENERAL INFORMATION

1.1 Package Description

There are no changes to the Model No. 10-160B package as described in the January 24, 2011, application, as supplemented April 6, September 9 and October 28, 2011. The applicant is proposing an additional component to the Model No. 10-160B package design with a Source Insert included into the cavity of the package.

The Source Insert adds photon (gamma) shielding to satisfy Normal Conditions of Transport (NCT) and Hypothetical Accident Conditions (HAC) dose rates. The side walls of the insert consists of lead with a total thickness of 6.0 inches, located between an inner 8.0-inch (nominal) schedule (SCH) 60 steel pipe and an outer 24.0-inch (nominal) SCH 60 steel pipe. The bottom consists of 6.0 inches of lead supported by a 0.75-inch thick steel base plate. The lid includes a steel encased lead plug (nominal lead thickness 8 7/8 inches), steel bolting plate, and flat silicon rubber gasket. Figures 5-2 and 5-3 of the August 2011 addendum to the application illustrate the source insert.

The steel cribbing used to support the source insert inside the package weighs less than 5,000 lbs. Therefore, the combined maximum load inside the Model No. 10-160B package will be 10,500 lbs, i.e., much smaller than the licensed weight of 14,500 lbs. The Source Insert is placed in the package cavity in such a way that its center of gravity is located near the center of gravity of the package. Therefore, the combined centers of gravity of the Model No. 10-160B package will remain at the same location as that already analyzed in the application.

1.2 Licensing Drawings

The staff reviewed Licensing Drawing Nos. C-038-145083-004, Rev. 0 and C-038-145083-005, Rev. 0, for the Source Insert assembly and details and the Source Insert steel cribbing, respectively. The staff determined that the submitted drawings are adequate. In particular, the staff noted that the safety classification for each component of the Source Insert is included on the Licensing Drawings.

1.3 Contents

With the addition of a shielded source insert, the Model No. 10-160B package can transport up to 10,000 Ci of ^{60}Co (approximately 9 grams) normal form radioactive material. The total mass of the contents, including any material encapsulating the normal form ^{60}Co radioactive material, dunnage, optional secondary containers, etc., does not exceed 500 pounds.

Staff noted that the structural calculations use 500 pounds as the mass of the contents. Staff also noted that no specific configuration of the radioactive material contents is stipulated because the shielding evaluation, in Chapter 5 of the Addendum, assumes that the radioactive material collapses to essentially a point source during HAC, and is also conservatively assumed as air in NCT.

1.4 Finding

The staff concludes that the information presented in this section of the application provides an adequate basis for the evaluation of the Model No. 10-160B package against 10 CFR Part 71 requirements for each technical discipline.

2.0 STRUCTURAL EVALUATION

The staff reviewed the application to verify that the changes made to the package design, as part of this amendment request, meet the structural requirements of 10 CFR Part 71 under NCT and HAC. The staff also reviewed the application to determine whether the package fulfills the acceptance criteria of NUREG-1609, "Standard Review Plan for Transportation Packages for Radioactive Material."

2.1 Evaluation

The applicant provided a structural evaluation in Report ST-663, Rev. 1, and demonstrated that the Source Insert, when placed inside the package, survives NCT and HAC loadings, while still satisfying the regulatory dose limits of 10 CFR 71.47 and 10 CFR 71.51.

Section 6.1 of ST-663, Rev. 1, evaluates the Source Insert and contents against the 10 CFR 71.45 regulatory lifting requirement of 3 against yield, and concludes that the new design has an ample margin (with a safety factor of 1.29). The package lifting and tiedown criteria are not re-evaluated as part of this amendment request since the previously approved application (weights) bounds the addition of the Source Insert (including the contents), as indicated in Section 2.4 of Addendum, August 2011. Staff also noted that, per Note 2 of licensing drawing No. C-038-145083-004, Rev. 0, the applicant will be testing the lifting lugs to 150% of the service load, and will also inspect them.

Section 6.3 of ST-663, Rev. 1, evaluates the package with the new insert against the 10 CFR 71.71 NCT drop cases. The applicant uses deceleration ratios of the previously approved package application to claim that HAC scenarios bound NCT scenarios. Staff noted that the applicant did not encompass the different service levels of ASME allowable stresses, per Regulatory Guide 7.6, but makes a ratio-based quantitative comparison. Staff believes this is a reasonable approach and concludes that NCT conditions are met.

Section 6.2 of ST-663, Rev. 1, evaluates the package with the new insert against the 10 CFR 71.73 HAC drop cases. The applicant uses the global deceleration values determined in the original package evaluation for the various drop cases, and applies them to the applicable components of the Source Insert. Staff noted that the applicant has not provided an acceptance criterion (other than against maximum allowable stresses) for the containment of the insert and that there was no discussion on the HAC crush or puncture tests (10 CFR 71.73(c)(2) and (3)) in the application. However, such conditions are bounded by the results of the original application (defining the containment boundary of the package) and the new Source Insert is not susceptible to failure under these test conditions.

Section 6.4 of ST-663, Rev. 1, evaluates the new insert against lead slumping and the potential loading induced to the shielded insert from the cribbing. The analysis of the lead shielding concludes that the flow stress generated during the HAC end drop is lower than the allowable, and that the lead shielding will not permanently deform. Staff concurs with this determination that the lead shielding will not slump and cause an increase in the HAC dose rates. Section 6.4.2 of ST-663, Rev. 1, details the cribbing load analysis. The analysis considers the effects of the bottom, middle, and top segments of the cribbing mass, and conservatively uses the cribbing yield stress (while not considering ASME code allowables) as the acceptance criteria for qualifying the cribbing members. The analysis considers the effects of HAC end and side drop tests (inputs of 176g and 121g respectively). The analysis also considers the damage that may occur from the effect that the cribbing members exert against the source insert. In general, NRC staff concludes that the analysis provides a reasonable justification that the new package configuration has adequate safety margin and meets the HAC drop test conditions and corresponding acceptance criteria.

2.2 Findings

All structural analysis and calculations that were submitted have adequately confirmed that the new design is acceptable and in compliance with the requirements of 10 CFR Part 71.

3.0 THERMAL EVALUATION

The staff reviewed the application to verify that the changes made to the package, as part of this amendment request, meet the thermal requirements of 10 CFR Part 71 under NCT and HAC. The staff also reviewed the application to determine whether the package fulfills the acceptance criteria of NUREG-1609, "Standard Review Plan for Transportation Packages for Radioactive Material."

3.1 Evaluation

For the configuration evaluated in this application, the heat load of the ^{60}Co source is 153.9 W, as discussed in Section 3.1 of the addendum, but a generic heat load of 200 W is used for the thermal evaluation as a conservative value. The thermal analysis for NCT and HAC has been performed using a 2-dimensional axisymmetric finite element model.

The resulting temperatures for the NCT and HAC analysis are presented in Tables 3.1-3 and 3.1-4 of the application, respectively. The temperature values for the various components analyzed remain under the allowable limits specified in the original application. However, it was noted that the resulting values of bulk air temperature within the package were higher than the ones presented in the original application. The staff noted that the bulk air temperature reported in the evaluation (298°F) corresponds to the maximum temperature of the air inside the package reached anywhere during the HAC fire event. This temperature is conservatively compared with the average bulk air temperature reported in the application. These maximum bulk air temperatures were used as conservative values to determine the maximum internal pressure of the package for NCT and HAC. The maximum internal pressures calculated were 3.6 psig and 6.4 psig, for NCT and HAC, respectively. Both pressures were significantly under the allowable values presented in the original application.

3.2 Findings

After reviewing this amendment request, the staff determined that the materials temperatures and internal pressures are acceptable for NCT and HAC. Staff concludes that this thermal evaluation satisfies the regulatory requirements of 10 CFR 71.71 and 10 CFR 71.73.

4.0 CONTAINMENT EVALUATION

The applicant has proposed no changes to the design of the containment for the Model No. 10-160B package design.

5.0 SHIELDING

The staff reviewed the application to verify that the changes made to the package, as part of this amendment request, provide adequate protection against radiation and meet the external radiation requirements of 10 CFR Part 71 under NCT and HAC. The staff also reviewed the application to determine whether the package fulfills the acceptance criteria listed in NUREG-1609, “Standard Review Plan for Transportation Packages for Radioactive Material.”

5.1 Description of Shielding Design

5.1.1 Shielding Design Features

The shielding design features of the Source Insert include the following: (i) inner shell sidewalls of cast lead (density of 11.3 g/cm^3 and a total thickness of 6.72 inches) located between an inner 8.0-inch (nominal) SCH 40 steel pipe and an outer 24.0-inch (nominal) SCH 60 steel pipe, (ii) a base consisting of 6.0 inches of lead supported by a 0.75-inch thick steel base plate, and (iii) an upper shield lid consisting of 8.625 inches of lead encased with steel.

Additional shielding is also provided by the 10-160B overpack shielding itself consisting of a 1-1/8-inch thick carbon steel inner shell, 1-7/8 inches of lead, and a 2-inch thick carbon steel outer shell. The inner and outer shells are welded to a 5-1/2-inch thick carbon steel bottom plate. The package lid is a 5-1/2-inch thick carbon steel plate with a 31-inch diameter opening equipped with a secondary lid.

5.1.2 Summary Tables of Maximum Radiation Levels

The applicant performed the shielding analysis using the MCNP5 computer code (Reference 2) and calculated NCT dose rates with a 10,000 Ci ^{60}Co distributed source located in the center of the package cavity.

Table 5-3 of the application summarizes the dose rates for NCT. Although the 10 CFR 71.47(b)(3) limit is at 2 meters from the external surface of the vehicle, the applicant calculated a maximum dose rate at 2 meters from the outer surface of the package and conservatively used this value to satisfy the 10 CFR 71.47(b)(3) limit.

Peak NCT Dose Rates for the 10-160B Package with Centered Source Insert (mrem/hr)

NCT	Package Surface			2 Meters from Package Surface		
Radiation	Top	Side	Bottom	Top	Side	Bottom
Gamma	2.9	0.8	6.5	0.2	0.1	NA[1]
Neutron	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]
Total	2.9	0.8	6.5	0.2	0.1	NA[1]
10 CFR 71.47(b) Limits	200	200	200	10	10	10

[1]The package is assumed centered on a 8-foot wide conveyance with the outer surface of the package approximately 40 inches (101.6 cm) above ground level. A dose rate +2m from the base is not available.
[2]The source consists solely of Co-60 and contains no neutron-emitting radioisotopes.

The applicant also calculated HAC dose rates (see Table 5-4 of the application) by conservatively assuming a 10,000 Ci ^{60}Co point source with the point source being relocated to the worst-case geometric configuration following an accident. Although the 10 CFR 71.51(a)(2) limit is at 1 meter from the external surface of the package, the applicant calculated a maximum dose rate at any point on contact with the outer surface of the package and conservatively used this value to satisfy the 10 CFR 71.51(a)(2) limit.

Peak HAC Dose Rates for 10-160B Package with Source Insert at Worst-case Geometric Configuration Following an Accident (mrem/hr)

HAC	1 Meter from Package Surface		
Radiation	Top[1]	Side[2]	Bottom[2]
Gamma	44.5[3]	27.8[3]	27.5[3]
Neutron	NA[4]	NA[4]	NA[4]
Total	44.5	27.8	27.5
10 CFR 71.51(a)(2) Limit	1000	1000	1000

[1]The bounding top HAC dose rate occurs with the insert inverted and positioned against the package inner top surface.
[2]The bounding side and bottom HAC dose rates occur with the insert lying sideways on the package inner bottom surface.
[3]Dose rates are conservatively calculated on contact with the package surface.
[4]The source consists solely of Co-60 and contains no neutron-emitting radioisotopes.

The staff reviewed Tables 5-3 and 5-4 of the application to ensure that the package meets the requirements in 10 CFR 71.47 and 10 CFR 71.51. The staff also verified that the dose rate in any normally occupied space (i.e., driver location) under normal conditions is less than the allowable limit of 2.0 mrem/hr, thus demonstrating compliance with 10 CFR 71.47(b)(4) for exclusive use shipments.

5.2 Radiation Source

5.2.1 Gamma Source

The maximum quantity of radioactive material that will be shipped with the Source Insert is 10,000 Ci of ^{60}Co. Table 5-5 of the application lists the photon emission probability for ^{60}Co as a function of energy. The applicant references the "NuDat" database at the National Nuclear Data Center of BNL. Conservatively assuming two photons per decay, the photon source activity for 10,000 Curies of ^{60}Co is $7.4\ 10^{14}$ photons/sec.

As shown in Table 5-5, only photons with energies above 0.347 MeV are included in the shielding calculations because photons with energies below 0.347 MeV are too weak to penetrate the steel of the package.

The staff reviewed the gamma source term for the proposed contents and also verified that the applicant specified the gamma source term as a function of energy.

5.2.2 Neutron Source

The ^{60}Co source term contains no neutron emitting radioisotopes.

5.3 Shielding Model

Chapters 2 and 3 of the application show that NCT tests do not impact the geometry of the source insert's shielding and that there will be no damage to the shielding of the source insert as a result of HAC. Thus, the packaging, previously reviewed and approved by the staff and documented in Reference 1, is not impacted by the addition of the Source Insert. The staff finds that the shielding model is consistent with the effects of the tests performed in compliance with 10 CFR 71.71 and 10 CFR 71.73. The staff finds that the application provides the basis for finding that the package has been adequately described and evaluated against NCT and HAC, as specified in 10 CFR 71.71 and 10 CFR 71.73.

There are no changes in the lead slump evaluation, which was previously evaluated by staff in Reference 1. The applicant's structural analysis of the Source Insert under HAC conditions demonstrates that the effects of lead slump are negligible (maximum deformation of 0.0525 in.) and that most of this deformation is recovered resulting in a very small lead slump, if any. Therefore, the applicant did not model lead slump in the shielding analysis. The staff finds such an approach to be reasonable.

5.3.1 Configuration of Source and Shielding

The staff examined Figures 5-1 through 5-11 of the application, the description of the modeling, and the MCNP input decks to determine how the shielding is modeled. The staff verified that the Source Insert dimensions are consistent with the licensing drawings. The applicant used nominal dimensions to model the package. The staff finds this approach acceptable because of the low dose rates.

5.3.1.1 Normal Conditions of Transport

The insert is modeled as concentric cylinders surrounding a source cavity with an inner carbon steel shield, surrounded in the radial direction by a lead shield and then surrounded by an outer carbon steel shield. The 10,000 Ci gamma source is modeled as a distributed source over the cavity volume. The composition of the source is conservatively modeled as air to conservatively eliminate any self-shielding due to the source material. The shoring is not included in the model to conservatively eliminate the small amount of added internal shielding provided by the shoring.

The staff verified that the applicant has a dose point for the following locations:

- External surface of the transport vehicle (axial and radial), and

- 2 meters from the surface of the transport vehicle.

The applicant did not calculate a dose point at 2 meters from, or on contact with, the external surface of the transport vehicle but calculated a maximum dose rate at 2 meters from the outer surface of the package and on contact with the external surface of the package and conservatively used these values to satisfy the 10 CFR 71.47(b) limits. Because these limits were met at 2 meters from, or on contact with, the packaging, the staff finds that it would meet the same limits with regard to the outer surface of the vehicle, as well. The staff finds that the applicant has evaluated the appropriate dose points per 10 CFR 71.47(b)(1), (2), and (3).

The staff verified that the applicant considered potential streaming effects from the Source Insert. As part of this verification, the staff reviewed the applicant's model of the drain line for the Source Insert, which by its nature is a potential streaming path. The drain line allows water to drain from the insert after loading ^{60}Co sources stored underwater. The applicant calculated the peak dose rate at the discharge to the drain line to be 1,058 mrem/hr, which is less than the peak dose rate of 1,250 mrem/hr (see Tables 6-1 and 6-4 of the application) on contact with the outer radius, which occurs at a higher elevation. Based on this comparison, the staff finds the drain line was adequately designed and does not adversely impact external radiation levels.

5.3.1.2 Hypothetical Accident Conditions of Transport (HAC)

As noted in Section 2.7.1.1.3 of the application, HAC conditions do not affect the shielding of the source insert, and there is little, if any, lead slump in the insert. Therefore, no lead slump was modeled in the shielding calculations. However, under HAC, neither the shoring nor the ^{60}Co source is expected to maintain structural integrity, and thus the source insert was modeled at various locations in the package cavity. The applicant selected four configurations for evaluation as the bounding geometries during HAC conditions as shown in Figures 5-8 through 5-11 of the application. Dose rates were determined at 1 meter from the package sidewall, top, and bottom. The staff finds this acceptable.

For all HAC cases, the ^{60}Co source term was modeled as a 1-cm sphere positioned against the interior side of the insert closest to the associated package exterior surface. The 1-cm sphere is essentially a point source, which models an extreme collapse of the ^{60}Co pins and conservatively maximizes the resulting HAC dose rates.

The staff verified that the applicant has a dose point 1 meter from the surface of the package for HAC as specified by 10 CFR 71.51(a)(2). The dose point was located in line with the point source to give the highest results. The staff finds this acceptable.

5.3.2 Material Properties

The staff verified that the applicant identified the materials and mass densities of the shielding materials for the source insert. Table 5-6 of the application provides a summary of the materials and their properties used in the shielding models. The applicant identified the inner and outer shell as carbon steel with a density of 7.82 g/cm^3, and the lead shield as commercial grade lead with a density of 11.30 g/cm^3. Such values are typical for shielding materials and are reasonable for use in the shielding analysis. The lead shielding was conservatively modeled with impurities at maximum values and minimum lead content. In addition, because the applicant assumes a point source for HAC conditions, no assumption is made regarding self-shielding, and thus, the staff finds that this is conservative. The staff also finds that the selected material compositions and densities are appropriate and provide reasonable assurance that the materials densities are adequately modeled for the shielding of the Source Insert.

The staff reviewed the MCNP input decks described in Section 5.5.2 of the application and confirmed that materials data used in the input are correctly selected.

5.4 Shielding Evaluation

5.4.1 Methods

For the shielding analysis the applicant used the MCNP5 computer code with photon and neutron cross-section sets designated ".04p," obtained from the ENDF/B-VIII photon data library provided with MCNP5. MCNP is a three dimensional code, widely used for shielding analyses, that staff has accepted for similar shielding evaluations.

Six models (two for NCT and four for HAC, as shown in Figures 4-1 through 4-6 of the application) were developed to determine external radiation levels at the package surface, at 2 meters from the package surface for NCT, and at 1 meter from the package surface for HAC.

For NCT, the applicant assumed a distributed source, which is appropriate due to the nature of the Co-60 pin sources being evenly distributed inside the Source Insert. For HAC, the applicant assumed the Co-60 pins are collapsed to approximately a point source (i.e., modeled as a 1-cm sphere), conservatively maximizing the resulting HAC dose rates. The four HAC configurations were selected to investigate various bounding geometry and source placement configurations of the source insert within the central cavity of the package.

5.4.2 Key Input and Output Data

The staff performed a review of the MCNP input decks provided by the applicant to ensure that the geometry and materials were appropriately specified. The staff determined that the selected detector locations are appropriate to detect possible radiation streaming paths. The staff also reviewed the output files provided by the applicant and determined that the results were properly represented in the application.

The staff confirmed that the applicant's calculated radiation levels under both NCT and HAC are in agreement with the summary tables and that they satisfy the limits in 10 CFR 71.47(b) and 10 CFR 71.51(a)(2).

5.4.3 Flux-to-Dose-Rate Conversion

The staff confirmed that the applicant used the ANSI/ANS 6.1.1-1977 (Reference 3) standard and finds this acceptable. The applicant performed the gamma flux-to-dose-rate conversion using the MCNP code and Table 3 from the standard.

5.4.4 Radiation Levels

The staff verified that the analysis showed that the locations selected are those of maximum radiation levels and include any radiation streaming paths. The staff also verified that the applicant's evaluation addresses damage to the shielding under NCT and HAC, as discussed in Section 5.3 of this SER.

5.4.5 Confirmatory Analysis

The staff performed independent confirmatory analyses using the MAVRIC sequence of the SCALE6 code (Reference 4) with the v7-27n19g cross section library to model gamma radiation. The results of the staff's confirmatory analyses show reasonable agreement with the applicant's shielding analysis for the limiting point source case.

5.5 Evaluation Findings

The staff reviewed the description of the package design features related to shielding and the source term for the insert and found them acceptable. The methods used are consistent with accepted industry practices and standards. The staff reviewed the maximum dose rates for NCT and HAC and determined that the reported values were below the regulatory limits in 10 CFR 71.47 and 10 CFR 71.51 for an exclusive use package.

Based on the staff's review of the statements and representations in the application and the results of staff's confirmatory analyses, the staff concludes that the design of the Model No. 10-160B package, with contents of 10,000 Ci of ^{60}Co placed in the Source Insert, provides a reasonable assurance to meet 10 CFR Part 71 requirements.

5.6 References

1. U.S. Nuclear Regulatory Commission, Safety Evaluation Report, Model No. CNS 10-160B Package, Certificate of Compliance No. 9204, Revision No. 15, February 28, 2011, ADAMS Accession No. ML110610496.
2. MCNP5 – A General Monte Carlo N-Particle Transport Code Version 5, X-3 Monte Carlo Codes Applied Physics Division, Los Alamos National Laboratory**,** April 24, 2003 (Revised 2/1/2008).
3. American Nuclear Society, ANSI/ANS 6.1.1 1977, Neutron and Gamma-Ray Flux-to-Dose-Rate Factors, La Grange Park, Illinois.
4. *SCALE: A Modular Code System for Performing Standardized Computer Analyses for Licensing Evaluations*, ORNL/TM-2005/39, Version 6, Vols. I-III, January 2009.

6.0 CRITICALITY EVALUATION

Not applicable.

7.0 PACKAGE OPERATIONS

A specific procedure for loading the Source Insert and loading the Insert into the package with the specified cribbing has been added to the general procedures for loading and unloading the Model No. 10-160B package. It is to be noted that the Source Insert will not be unloaded.

In particular, the package cavity shall be vacuum dried if the insert is loaded underwater. Radioactively contaminated liquids are pumped out, removed by the use of an absorbent material or via the drain line. Leak testing is required when seals are replaced (including seals on the optional vent and drain ports): the pressure drop leak test of the package primary lid, secondary lid, vent line, or drain line (as applicable) is performed in accordance with the Chapter 8 of the application.

The staff reviewed the operating procedures and concludes that the operating procedures both meet the requirements of 10 CFR Part 71 and are adequate to assure the package will be operated in a manner consistent with its evaluation for approval.

8.0 ACCEPTANCE TESTS AND MAINTENANCE PROGRAM

The applicant has proposed no changes to the general acceptance tests and maintenance program of the package. However, acceptance tests of the Source Insert, pertaining to visual examination, structural testing, load testing, and shielding integrity testing, have been included.

There are no routine or periodic maintenance activities for the Source Insert which is a single use container.

CONDITIONS

The conditions specified in the Certificate of Compliance have been revised to incorporate several changes as indicated below:

Item No. 3.b has been revised to identify Energy*Solutions*' request dated April 6, 2011.

Condition No. 5(a)(2) has ben revised to describe the Source Insert. The source insert design weight is 8,000 lbs; it has side walls consisting of 6.0-inch thick lead, sandwiched between an inner 8 inches nominal SCH 60 steel pipe and an outer 24.0-inch SCH 60 steel pipe. The bottom of the source insert also consists of lead supported by a 0.75-inch thick steel base plate. The lid includes a steel encased lead plug, steel bolting plate and flat silicon rubber gasket.

Condition No. 5(a)(3) has been revised to include two new drawings: Energy*Solutions* Drawing No. C-038-145083-004, Rev. 0, and Drawing No. C-038-145083-005, Rev. 0.

Condition No. 5(b)(1)(vi) has been added to include byproduct material as normal form solid metal loaded into the new Source Insert.

Condition No. 5(b)(2)(i) has been revised to add maximum authorized contents with a limit of 10,000 Ci of ^{60}Co.

Condition No. 5(b)(2)(vi) has been added to specify that the contents of the source insert have a maximum weight of 500 pounds.

Condition No. 14 has been added to authorize use of the previous revision of the certificate for a period of approximately one year.

As a result of the addition of Condition No. 14, Conditions No. 12 and 13 of the previous certificate were renumbered.

CONCLUSION

Based on the statements and representations in the application, as supplemented, and the conditions listed above, the staff concludes that the Model No. 10-160B package design has been adequately described and evaluated and that these changes do not affect the ability of the package to meet the requirements of 10 CFR Part 71.

Issued with Certificate of Compliance No. 9204, Revision No. 18,
on January 11, 2012.